

CLAIMS

What is claimed is:

1 1. A method for cutting a non-metallic substrate, comprising the steps of:
2 scanning a first laser beam for breaking molecular bonds of the non-metallic
3 substrate material on a cutting path formed on the non-metallic substrate to form a
4 scribe line having a crack to a desired depth; and

5 scanning a second laser beam along a scanning path of the first laser beam to
6 propagate the crack in a depth direction of the substrate and to completely separate the
7 non-metallic substrate.

1 2. The method of claim 1, wherein the first laser beam has a wavelength
2 having an absorptivity of 90% or more with respect to the non-metallic substrate.

1 3. The method of claim 2, wherein the non-metallic substrate is a glass,
2 and the first laser beam is a 4th harmonics YAG laser beam having a wavelength of 266
3 nm.

1 4. The method of claim 1, wherein the first laser beam is scanned from a

2 starting point of the cutting path to an end point of the cutting path.

1 5. The method of claim 1, wherein the second laser beam is a CO₂ laser
2 beam.

1 6. The method of claim 1, wherein the first laser beam has a width less
2 than that of the second laser beam.

1 7. The method of claim 1, wherein the second laser beam is directly
2 scanned onto the scribe line.

1 8. An apparatus for cutting a non-metallic substrate, comprising:
2 a first laser beam generating means that generates a first laser beam for
3 breaking molecular bonds of the non-metallic substrate material so as to heat a cutting
4 path formed on the non-metallic substrate and to form a scribe line having a crack to a
5 desired depth; and
6 a second laser beam generating means that generates a second laser beam for
7 propagating the crack along a scanning path of the first laser beam in a depth direction
8 of the substrate.

1 9. The apparatus of claim 8, wherein the first laser beam has a wavelength
2 having an absorptivity of 90% or more with respect to the non-metallic substrate.

1 10. The apparatus of claim 9, wherein the first laser beam is a 4th
2 harmonics YAG laser beam having a wavelength of 266 nm.

1 11. The apparatus of claim 8, wherein the second laser beam is a CO₂ laser
2 beam.

1 12. The apparatus of claim 8, wherein the first laser beam has a width less
2 than that of the second laser beam.

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13. The apparatus of claim 8, wherein the second laser beam is directly
scanned onto the scribe line.